

**Dudley  
Zoological  
Gardens**

**Structural Engineering  
Specification for repairs  
to the Entrance Canopy  
and Shop.**

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### SPECIFICATION ISSUE SHEET

Amendment No.	Date of Amendment	Issued By	Approved By	Description
T1	2/8/13	AW	ST	For Tender
C1	23/10/13	ST	ST	For Construction

This specification is to be read in conjunction with the Architect and Engineer's drawings and the contract documents.

## **1.0 GENERAL**

- 1.1 The contractor is responsible for verifying all site and setting out dimensions and levels, including 'as built' portions of retained structure and temporary works, before commencing the works.
- 1.2 The Contractor shall ensure that the stability of the existing structures is maintained at all stages of the works. He shall design, install and maintain all necessary temporary works, and programme the works accordingly.

The Contractor shall prepare his own proposals for the sequence of construction for which he shall remain entirely responsible.

- 1.3 Investigations and opening up - The contract drawings indicate the expected scope of the structural works. These have been prepared without full access to the existing structures. Final structural details can only be confirmed following opening up, cleaning of the concrete by the Contractor and the completion of sample repairs. These areas include:
  - Shop roof
  - Shop interior
  - Entrance canopies above the ticket kiosks.
- 1.4 The contractor is to allow sufficient time in the contract programme to carry out the opening up. Once the work described above is complete allow 5 working days for the design team to prepare and issue final details for construction.
- 1.5 The buildings and structures to be repaired are listed. A conservation-based approach to the repairs has therefore been used for the design and this is to be adopted and followed by the contractors. The principles of the design include that the maximum amount of original material will be retained, that original shutter board marks will be maintained or replicated in new finishes, the surface texture will match the original and that compatible repair materials will be used wherever possible.
- 1.6 Where it is not feasible to use traditional concrete for the repairs the drawings show the use of materials by Fosroc. The contractor can propose similar products by other manufacturers. The use of alternatives will be subject to agreement by the architect and engineer and will require the approval of trial sample panels before use.

- 1.7 All specialist repair materials are to be used in conjunction with the manufacturer's recommendations.
- 1.8 All repair works to be in accordance with BS EN 1504: Products and systems for the protection and repair of concrete structures, the book by English Heritage "Practical Building Conservation: Concrete", and this specification. Where there is a conflict it shall be deemed that this specification will take precedence.

## **2.0 CONCRETE CLEANING**

- 2.1 Trial methods to remove paint finishes were carried out during 2013 in accordance with BS 8221-1-2012: Code of Practice for cleaning and surface repair of buildings – Part 1: cleaning of natural stone, brick, terracotta and concrete.
- 2.2 This found that standard grit blasting proved most successful in removing the applied surfaces without causing significant damage to the underlying concrete. Trial samples of cleaning using this method are to be carried out at the start of the works and be subject to agreement by the architect. Refer also to the architect's specification.

## **3.0 CONCRETE REPAIRS**

- 3.1 A range of repairs have been developed, as noted below and shown on the structural drawings.
- 3.2 A trial panel for each type of repair is to be carried out at the start of the works in locations to be agreed on site. The aim of these samples is to review the methodology and agree items such as how long to maintain the shuttering and how best to carry out a surface treatment to match the surrounding finish.
- 3.3 Repair Type 1.

Application – On the top of level surfaces and vertical faces where replacement of concrete is greater than 25mm in depth and the cover to the reinforcement is greater than 20mm. Also use for the rebuilding of the parapet walls to the bear ravine.

Materials - Grade C40 OPC to BS 8001 concrete with graded aggregate up to 5 mm in size for repairs and up to 20mm for larger areas of rebuilding. Do not use marine aggregates.

Procedure – The edges of damaged concrete should be cut out using an angle grinder. Do not cut reinforcement. The arrises should be slightly undercut to improve the mechanical adhesion of the repair material. Concrete within the cut lines is to be carefully removed with a sharp chisel or hand-held mechanical tools, taking care to avoid damage to the sound concrete.

Remove all loose and damaged concrete. Clean exposed reinforcement to remove all loose scale and rust back to a bright, shiny finish. Immediately before placing the repair material coat the exposed bars and concrete substrate with cement slurry. Place and thoroughly compact the concrete repair material.

Shuttering is to be designed to match the existing finishes. For the bear ravine a corrugated surface finish is required. Prevent surface evaporation from concrete by retaining formwork and shuttering in position and, if necessary, covering surfaces immediately after striking. Cover top surfaces immediately after placing and compacting the concrete, removing covering only to permit any finishing operations and replacing immediately thereafter. Maintain the surface temperature above 5 deg C for at least five days,

After removing the shuttering to carry out any special surface treatment protect the repaired area to prevent premature drying.

#### 3.4 Repair Type 2

Application - Repair to soffits and sides with voids greater than 10mm from the surface

Materials- Fosroc Renderoc HB or similar approved.

Procedure – The previous patch repairs and damaged concrete should be cut out using an angle grinder. The arrises should be slightly undercut to improve the mechanical adhesion of the repair material. Edges should be cut to allow a minimum 10mm coating and maintain the existing profile.

Remove all loose and damaged concrete and expose all surfaces of corroded reinforcement. Clean the reinforcement to remove all loose scale and rust back to a bright, shiny finish and apply Nitoprime Zincrich Plus. Wet and prime the concrete as Fosroc recommendations before applying the Renderoc HB minimum 10mm thick

followed by the Nitobond AR as Fosroc recommendations. Manually work the exposed surface to match the surrounding surface finishes, including board marks.

Shuttering is to be designed to match the existing finishes. For the bear ravine a corrugated surface finish is required. After removing the shuttering for any special surface treatment protect the repair to prevent premature drying.

### 3.5 Repair Type 3

Application - Repair to top, soffits and sides where the reinforcement is less than 10mm from the surface of the concrete.

Materials- Fosroc Renderoc ST05 or similar approved.

Procedure – The previous patch repairs and damaged concrete should be cut out using hand-held tools. Remove all loose and damaged concrete. Clean the exposed surfaces of the reinforcement to remove all loose scale and rust back to a bright, shiny finish and Wet the concrete as Fosroc recommendations before applying Renderoc ST05 to a nominal 4mm thickness followed by the Nitobond AR as Fosroc recommendations. Manually work the exposed surface to match the surrounding surface finishes, including board marks. Protect the surface finish as the manufacturer's recommendations.

### 3.6 Repair Type 4

Application – To voids around column heads in the entrance canopy

Materials- Fosroc Conbextra HF or similar approved.

Procedure – Provide temporary support to the slab adjacent to the column.

The edges of damaged concrete should be cut out using an angle grinder. Do not cut reinforcement. The arrises should be slightly undercut to improve the mechanical adhesion of the repair material. All previous patch repairs and damaged concrete should be carefully removed using hand-held tools. Do not cut reinforcement.

Remove all loose and damaged concrete and expose all surfaces of corroded reinforcement. Clean the reinforcement and steel column and head plate to remove all loose scale and rust back to a bright, shiny finish and apply Nitoprime Zincrich Plus. Wash through with clean water to remove all dust and debris. Place the Conbextra HF followed by the Nitobond AR as Fosroc recommendations. Manually work the exposed

surface to match the surrounding surface finishes, including board marks. Protect the surface finish as the manufacturer's recommendations.

3.7 Unless noted all welds to be 6mm full profile fillet welds. Carefully dress to remove slag without deforming the surface of the weld. Site welding is not permitted.

3.8 All internal steelwork to be thoroughly wire-brushed to remove all loose rust and scale, and painted with two coats of high build zinc phosphate primer with touch-up on site after erection.

3.9 Concreting in cold weather

Comply with the requirements of the repair manufacturer. No concrete shall be mixed or placed until the shade temperature reaches 3 degrees C on a rising thermometer, nor shall concreting continue when the shade temperature falls below 5 degrees C. The newly cast concrete shall be insulated and protected from low temperatures, snow, ice and other frozen materials, until such time as the concrete has attained sufficient strength and hardness to render it non susceptible to frost attack. The temperature of newly placed repairs should not be allowed to fall below 5 degrees C. Any repairs that are damaged by frost are to be removed and replaced.

3.10 Concreting in hot weather

At the time of placing no part of the concrete shall have a temperature exceeding 30 degrees C. Protect to prevent rapid moisture loss or heat gain.

#### **4.0 STEELWORK REPAIRS**

4.1 New steelwork to be grade S275 to BS EN 10 025. Materials and workmanship to BS 5950: Part 2.

4.2 All external exposed steelwork to be blast cleaned to Preparation Grade Sa2½ (ISO 8501-1: 1988). Apply two coats of Interzinc 52 HS.(by International Paint Ltd) and a finish coat to architect's details.